WHAT IS CLAIMED IS:

1. A method of performing finite element analysis on a shell including:
   (a) modeling the geometry of the shell using subdivision surfaces;
   (b) characterizing an environment for the shell, including environmental factors affecting the mechanical behavior of the modeled shell;
   (c) computing the mechanical response of the modeled shell, taking into account the characterized environment, using a finite element analysis; and
   (d) outputting a description of the geometry of the modeled shell as determined from the computed mechanical response.

2. The method of claim 1, wherein the environment factors includes loading conditions, material properties, and boundary conditions for the modeled shell.

3. The method of claim 2, wherein the loading conditions includes an indication of applied forces.

4. The method of claim 2, wherein the loading conditions includes an indication of thermal loading.

5. The method of claim 1, further including outputting indications of the characterized environment.

6. The method of claim 1, wherein the finite element analysis uses subdivision basis functions as shape functions.

7. The method of claim 1, wherein the finite element analysis uses suitably smooth shape functions.

8. A method for performing finite element analysis using subdivision basis functions, including:

(a) inputting a mesh comprising a set of data points each having connectivity to neighboring data points, the mesh defining physical parameters;

(b) specifying an initial state for the mesh;

(c) defining a set of linear differential equations comprising a stiffness matrix and an external forcing vector, at least one such equation having a fourth order differential operator;

(d) solving the set of linear equations as applied to the mesh;

(e) outputting the solution to the set of linear equations as defining a modification of the initial state of the mesh based on the stiffness matrix and in response to the external forcing vector.

9. A system for performing finite element analysis on a shell including:
   (a) means for modeling the geometry of the shell using subdivision surfaces;
   (b) means for characterizing an environment for the shell, including environmental factors affecting the mechanical behavior of the modeled shell;
   (c) means for computing the mechanical response of the modeled shell, taking into account the characterized environment, using a finite element analysis; and
   (d) means for outputting a description of the geometry of the modeled shell as determined from the computed mechanical response.

10. The system of claim 9, wherein the environment factors includes loading conditions, material properties, and boundary conditions for the modeled shell.

11. The system of claim 10, wherein the loading conditions includes an indication of applied forces.

12. The system of claim 10, wherein the loading conditions includes an indication of thermal loading.

13. The system of claim 9, further including means for outputting indications of the characterized environment.

14. The system of claim 9, wherein the finite element analysis uses subdivision basis functions as shape functions.

15. The system of claim 9, wherein the finite element analysis uses suitably smooth shape functions.

16. A system for performing finite element analysis using subdivision basis functions, including:

(a) means for inputting a mesh comprising a set of data points each having connectivity to neighboring data points, the mesh defining physical parameters;

(b) means for specifying an initial state for the mesh;

(c) means for defining a set of linear differential equations comprising a stiffness matrix and an external forcing vector, at least one such equation having a fourth order differential operator;

(d) means for solving the set of linear equations as applied to the mesh;

(e) means for outputting the solution to the set of linear equations as defining a modification of the initial state of the mesh based on the stiffness matrix and in response to the external forcing vector.

17. A computer program, residing on a computer-readable medium, for performing finite element analysis on a shell, the computer program comprising instructions for causing a computer to:

(a) model the geometry of the shell using subdivision surfaces;

(b) characterize an environment for the shell, including environmental factors affecting the mechanical behavior of the modeled shell;

(c) compute the mechanical response of the modeled shell, taking into account the characterized environment, using a finite element analysis; and

(d) output a description of the geometry of the modeled shell as determined from the computed mechanical response.

18. The computer program of claim 17, wherein the environment factors includes loading conditions, material properties, and boundary conditions for the modeled shell.

19. The computer program of claim 18, wherein the loading conditions includes an indication of applied forces.

20. The computer program of claim 18, wherein the loading conditions includes an indication of thermal loading.

21. The computer program of claim 17, further including instructions for causing the computer to output indications of the characterized environment.

22. The computer program of claim 17, wherein the finite element analysis uses subdivision basis functions as shape functions.

23. The computer program of claim 17, wherein the finite element analysis uses suitably smooth shape functions.

24. A computer program, residing on a computer-readable medium, for performing finite element analysis using subdivision basis functions, the computer program comprising instructions for causing a computer to:

(a) input a mesh comprising a set of data points each having connectivity to neighboring data points, the mesh defining physical parameters;

(b) specify an initial state for the mesh;

(c) define a set of linear differential equations comprising a stiffness matrix and an external forcing vector, at least one such equation having a fourth order differential operator;

(d) solve the set of linear equations as applied to the mesh;

(e) output the solution to the set of linear equations as defining a modification of the initial state of the mesh based on the stiffness matrix and in response to the external forcing vector.